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CONNECTICUT ENVIRONMENT

Published 11 times a year by The Connecticut Department of Environmental Protection

It's January. Where's "Bufo americanus"?

January 1991

CONNECTICUT
ENVIRONMENT
January 1991
Volume 18 Number 5
$7/yr.

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Commissioner
Leslie Carothers
Director of Communications
Wanda Rickerby
Senior Communications Officer
Margot Callahan
Editor
Robert Paier
Graphics
Rosemary Gutbrod
Composition
Caryn Furbush
Circulation
Olive Tyghter
Business Manager
Donna Fadoir

Phone
566-5599

DEP Connecticut Environment

Published 11 times a year by the Department of Environmental Protection. Yearly subscription, $7.00; two years, $13.00. Second class postage paid at Hartford, Connecticut. Please forward any address change immediately. Material may be reprinted without permission provided credit is given, unless otherwise noted. Address communications to Ed., **DEP Connecticut Environment.** Dept. of Environmental Protection, Rm. 112, State Office Bldg., Hartford, CT 06106.

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Editor's Note

We've never met, but I keep thinking about you. Why? Dozens of reasons. Because I work for you. And inform you. And entertain you. And intrigue you. And challenge you.

Connecticut Environment is my job. And my pleasure. And my interesting challenge. Which brings me back to you our reader, our subscriber, our backbone. A new year is starting. 1991. What would you like to see...and read about...and learn about in our publication?

Eleven more exciting months coming up. The environment is everywhere...all the time...changing and growing and, very often needing help.

Please write to us (the address is right there on the left). Here's a handful of questions, to quick-start your thinking machine.

Major topics: Which do you want us to seek out and/or expand? Have we editorially over-cooked some? Have we unintentionally ignored some? How about areas of our state? What do you want our writers to visit...and question...and write about?

Personal interviews? Personality profiles? Anyone special on your mind?

You've read this far. In coming weeks and months, I'm hoping to read dozens of informative thoughts from you.

Thank you.

■

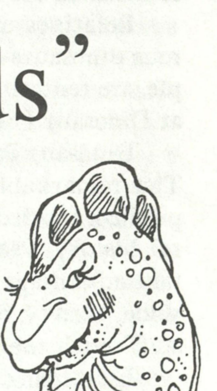
Jeanne Pronsky, one of Dinosaur Park's 25 to 35 active volunteers, explains some of the park classroom's models to a visitor. Pronsky serves as a docent on Sunday afternoons. Along with serving as docents and trail guides and helping with educational programs, the volunteers, who give the park some 50 to 60 hours of help each month, assist with clerical and computer work, work in the park bookstore/gift shop, and help maintain the park's trails and gardens. Over the years, the "Friends'" fund raising has also helped the park purchase dinosaur models, a granite timeline just installed on the exterior of the Exhibit Center, and a mural that's currently being designed.

Dinosaurs Have Good "Friends"

by **Stephanie M. Speziali**
Environmental Intern

Illustrations: **Jacqueline Jacobs**

Photos: **Margot Callahan**



SUBTLY LIT TRACKS, housed by Dinosaur State Park's 122-foot geodesic dome, appear deceptively fresh; one can easily imagine the huge creatures who made them hunting their prey in lush, subtropical mudflats.

The park's dinosaur trackway is actually an excavated bedrock layer of 185-million-year-old grey sandstone. After the tracks were created by the contact of the animals' feet with the earth, they were preserved by a series of physical processes: sediments filled in the tracks and solidified into rock over millions of years of time.

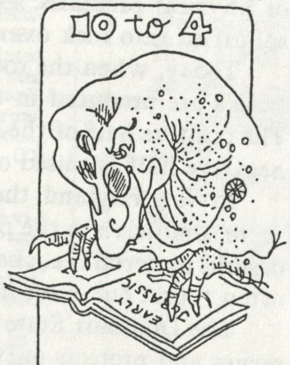
Today, when the rock layers are separated, fossilized tracks are produced in two parts: positive and negative. The positive half of the track is depressed or indented; the negative half is raised or mound-like.

In New England, the climate and sedimentation rates were conducive to the preservation of tracks rather than organic material (i.e., skeletal remains, etc.), which is more often found out west in places such as Arizona.

The Dinosaur State Park Exhibit Center's dome preserves and protects only 500 of about 2,000 tracks accidentally discovered on the site in 1966 during excavations

Though Dinosaur State Park takes its dinosaurs seriously, the "Friends" do occasionally have a little fun ... with projects like a dinosaur footprint Christmas tree which "Friends" president Chris Sprague made last year for the Rocky Hill Public Library. Or, here, with Christmas stockings – being removed by Roseann Gorski – designed to fit the feet that made the park's tracks. "Friends" membership includes a discount at the bookstore, a newsletter, notice of special events, and reduced admission charges. Cost ranges from $10 for individuals and $15 for families to $300 for a life membership. Call 257-7601 for information.

FDPA
BOOKSTORE
TUESDAY - SUNDAY
10 to 4



for a new state building. The quality and abundance of the tracks are unusual so the trackway has, not surprisingly, been designated a National Natural Landmark due to its paleontological significance.

TRACKS like those at Dinosaur State Park provide evidence for dinosaur posture, behavior, and speed and also supplement information on geographic and chronological distributions of vertebrates, among other things, according to Richard Krueger, geologist and Director of Dinosaur State Park.

Among a number of spectacular finds in the park's trackway are "swimming tracks." These tracks are the very first evidence supporting the idea that large, carnivorous dinosaurs swam.

Since animals are rarely found fossilized in their tracks, making correlations between organisms and tracks is very difficult. Hence, separate nomenclatures have been established for animals and tracks.

Relatives of the Arizonian *Dilophosaurus*, carnivorous dinosaurs of the *Podokesauridae* family, for example, are tentatively correlated with the *Eubrontes* tracks at Dinosaur Park.

Dinosaur Park has by no means stopped in its tracks. This remarkable facility is devoted to promoting greater public knowledge about geology, paleontology, and natural history. People of all ages, from all over the world, take advantage of tours, slide presentations, movies, and a wide variety of educational programs provided by the staff with the support of the Friends of Dinosaur Park.

Established in 1976, the "Friends," a non-profit, volunteer group (which now has about 270 members), has responded to far more that the obvious need to preserve and protect the tracks at the park site.

Jacqueline Jacobs helps out in the bookstore, here. Jacobs, a former fashion artist, also illustrates park promotional and informational materials and displays. The bookstore sells an array of accurate dinosaur models, fossils and minerals, adult and children's books on dinosaurs and related subjects, posters, tee-shirts, and other dinosaur related materials. It also has a paid staff member, Jane Nash, thanks to the support of the "Friends." For the really serious fan of dinosaur collectibles, there's also another of the "Friends'" special events, the annual "Dinomania." This year it's on Saturday, April 13th.

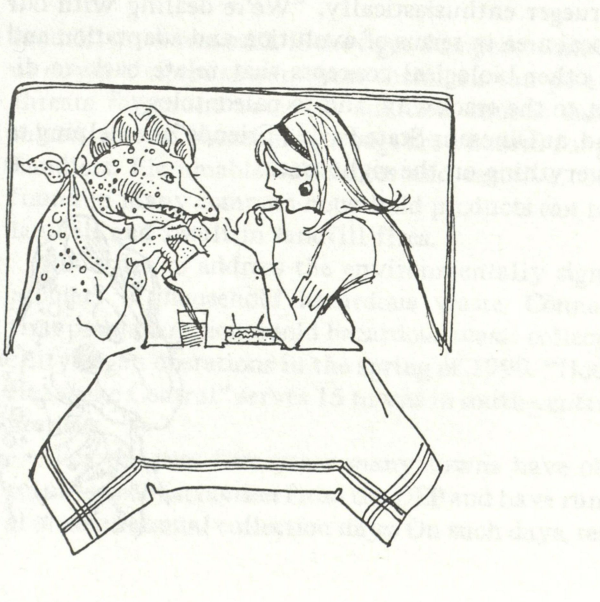
To augment state funding, the group raises money to finance exhibits, programs, and educational materials. Most of their revenue is derived from the profits of the "Friends'" bookstore (in the Exhibit Center) which sells T-shirts, posters, rocks, fossils, minerals, and dinosaur models as well as an extensive assortment of dinosaur books. The Friends also organize fund-raisers and accept donations.

In addition to the trackway and the bookstore, the geodesic dome includes a classroom and an auditorium. In the classroom, children work with volunteer docents as well as the park's naturalists, Eric Thomas and Mary Brescia. Well-attended monthly science lectures for adults are among the programs held in the center's auditorium.

OUTSIDE THE DOME are 40 acres devoted to different activities. In the Casting area, open from May 1st to October 31st, visitors are encouraged to make plaster-of-Paris casts of tracks to take home.

There are two boardwalks on the nature trails, a recently developed butterfly garden, flower and rock gardens, a red maple swamp, a native plant meadow, and a picnic area.

A staff of five operates the park -- which gets more than 80,000 visitors annually. A group of 25 to 35 volunteers, recruited and organized by the Friends of Dinosaur Park Association, help out -- putting in, at a guess, 50 to 60 hours of work a week. They work in the bookstore and the office, helping senior clerk Brenda Sauer; help with publicity and special programs; work in the gardens; assist with special events; teach special classes; and act as guides for trail walks.



Although the volunteers are not able to do much of the hard physical labor, they also do what they can to assist Larry Butts, who's currently the park's only permanent maintainer.

"We couldn't make it without the 'Friends' and the volunteers. They make all the difference," says Krueger.

Why volunteer to help the "Friends"? "Because I get as much as I give," says Chris Sprague, an active volunteer since 1979 and currently the group's president. "I'm interested in nature and ecology and people, and I think everybody here is too. Here is the focus that I like. Where else can you go in society where you can meet people that have the same interests you do?"

The "Friends" and especially the volunteers and Dinosaur Park's staff are looking forward to the park's continuing development as an educational facility. The present building does not have enough office and work space for staff and volunteers. An additional facility is also needed to house the remaining 1,500 tracks which were temporarily reburied under a protective covering back in 1967.

Site improvements, including a new entrance, parking lot, sidewalks, lighting, and landscaping have just been completed. The entrance walk contains a granite timeline representing 4.6 billion years of earth history. The landscaping includes more than 100 species and varieties of conifers -- plants which are related to the Mesozoic flood. This planting enlarges the "Arboretum of Evolution" that has been under development with the "Friends'" help since 1980.

Artist Will Sillin has been commissioned by the Friends of Dinosaur Park to create a 14 by 30 foot painting which will depict the Connecticut Valley in the Triassic Period.

"I've been with the park for 20 years now, and we still have a long way to go," says Krueger. "Everywhere I look, I have a catalogue in my mind of what needs to be done."

But the primary goal of Dinosaur Park is continually being realized. "Nature centers that excel are the ones that best figure out what they've got to work with. We're not another Peabody Museum. We do our own thing here," says Krueger enthusiastically. "We're dealing with our own, local area in terms of evolution and adaptation and all the other biological concepts that relate back to dinosaurs, to the trackway, and to paleontology."

And, at Dinosaur State Park, "Friends" are helping to keep everything on the right track. ■

Roseann Gorski, who is vice-president of Friends of Dinosaur Park, shows park director Richard Krueger one of the 1,100 entries in the Fourth Annual Dinosaur Art Contest, one of the special events sponsored each year by the "Friends". First, Second, and Third Prize winners and honorable mentions in five grade categories for kindergarten through eighth grade students will be on display at the park during the month of February, Tuesday through Saturday, 9 a.m. to 4:30 p.m. Admission to the Exhibit Center is $2 for adults, $1 for children 6-17.

Residents of 15 south central Connecticut towns can now dispose of household hazardous materials on 30 Saturday mornings a year. (*Photos: Robert Paier*)

'Hazwaste Central' success story

by **Sarah Collins**, Environmental Intern

ARE HOUSEHOLD HAZARDOUS WASTES really that hazardous? Did you know that . . .

One pint of a common degreaser found in some household cleaners can pollute *ten million gallons* of water.

One cup of trichloroethylene, a chemical found in products such as septic tank cleaners, furniture strippers, and dry cleaning fluids, can contaminate *three million gallons* of water.

A few drops of some synthetic organic chemicals (SOCs) can contaminate enough water to fill a *swimming pool.*

WHILE HIGHLY TOXIC, these and other household chemicals are not regulated as hazardous wastes. If they are thrown into the trash and end up in an unlined landfill or, worse still, if they get dumped behind a bush or down a storm sewer, these chemicals can pose serious threats to groundwater. In addition, caustic substances mixed in with household garbage are a hazard for garbage handlers. Flammable substances and reactive chemicals found in many common household products can mix in a landfill and result in landfill fires.

In order to address the environmentally significant problem of household hazardous waste, Connecticut's first permanent household hazardous waste collection facility began operations in the spring of 1990. "Household Hazwaste Central" serves 15 towns in south-central Connecticut.

For the past five years many towns have obtained permits and instruction from the DEP and have run annual or semi-annual collection days. On such days, residents are encouraged to bring in household chemicals such as pesticides, solvents, cleaners, paints, batteries, waste oil, and anti-freeze. Scheduled around spring and fall cleaning, these collection days are generally well-attended and run very smoothly. However, a one-day collection is costly; some towns cannot afford to have them. In addition, participation is limited by the short hours of operation.

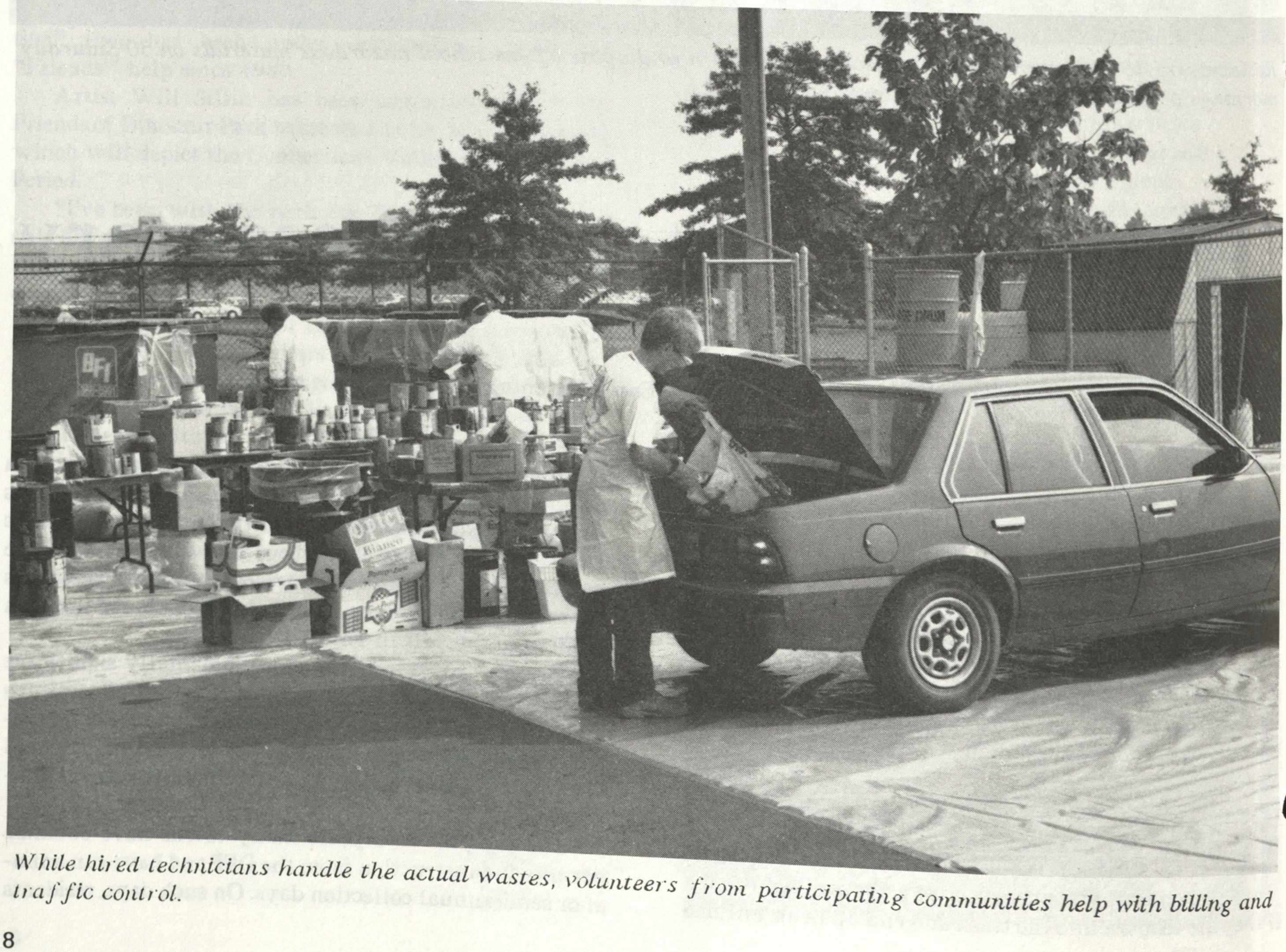
Connecticut's South Central Regional Water Authority, having a vested interest in preserving the state's ground water quality, has assisted many municipalities with their yearly collection days. Recognizing that cost is a major factor in the correct disposal of household hazardous waste, the Water Authority joined forces with the South Central Regional Council of Governments in an effort to come up with a more comprehensive, centralized, and thus more economical, collection program. Out of this was born the idea for a permanent facility to collect and store household hazard waste from all the South Central towns. The project's success is the result of the combined efforts of private citizens, municipalities, state government, and industry.

Thomas Jackson, director of public affairs for the Regional Water Authority, predicts that the center will become "the keystone of a regional effort which would make it easier to dispose of these materials safely, so that they are not a hazard to our water supply or the environment."

According to Leslie Lewis, a senior environmental analyst with the DEP's Bureau of Environmental Services, "the greatest advantages of the permanent facility are that it increases citizen participation since it is open 30 Saturday mornings, spring through fall, and that it saves a tremendous amount of money since we don't have to send off partially-filled waste containers."

While the Water Authority paid the initial construction cost for the facility, the participating municipalities will eventually reimburse them. The project was also moved forward by some generous donations. Olin Charitable Trust donated $30,000 for program education and two workers per week. Browning Ferris Industries gave the facility two large dumpsters. Other contributions came from the DEP, Humphrey Chemical Company, Cestari and Company, Community Health Care Program, and Habitat for Humanity.

According to Suzanna Benson, a hazardous waste consultant retained by the Water Authority, other permanent collection facilities exist in the U.S. and the Authority worked with firms which had previously helped establish centers in Sturbridge, Massachusetts, and on Martha's Vineyard. What makes Household Hazwaste Central unique is that it went through the state's permit-



While hired technicians handle the actual wastes, volunteers from participating communities help with billing and traffic control.

ting process and is subject to a variety of new regulations. Since household-produced hazardous waste is still considered "normal" solid waste, the site is permitted as a solid waste facility, yet it must adhere to strict hazardous waste regulations.

THE FACILITY IS LOCATED at 90 Sargent Drive, the grounds of the Regional Water Authority in New Haven. Storage areas are at loading-dock height, well above the 100-year flood line, and are equipped with two separate fire suppression systems. There are two storage tanks for used motor oil and one for used anti-freeze, as well as compartments designed to house 55-gallon drums of segregated waste. There is an electric lift so that toxic substances do not have to be hoisted overhead by hand; two eyewash stations and a shower further insure the safety of workers handling the waste.

When confronted with the issue of safety for a site such as Hazwaste Central, Leslie Lewis responds, "I always tell people the storage hazard is much lower than at a hardware store or a gardening center where these things are all on the shelves, sometimes not even containerized, and there is no segregation of materials that could react with one another. I feel the safety factor is addressed very well in our permit, which requires the facility to meet strict specifications in design and operation. The DEP made the decision to develop a special solid waste transfer permit that would cover, very specifically, household hazardous waste and that gave us a good control on how the facility would be built and operated. It was really a learning experience for our engineers and for the Authority. I think the biggest concern of municipalities or other groups that might be sponsoring this kind of program is the issue of long-term liability. But that is an issue no matter what they do – with collection days it is also an issue."

A TYPICAL SATURDAY MORNING COLLECTION illustrates the cooperative efforts behind the project's success. While the center is operated by technicians from North East Solvents Reclamation, Inc., the vendor hired to handle and ship the waste, volunteers from the participating communities collect billing information and direct cars into the unloading zone. Volunteer organizations such as the Jaycees or the League of Women Voters are solicited to assist in a collection and to do localized publicity for the facility. According to Benson, establishing these "hometown days" helps alleviate peak periods. "We get really great volunteer groups. Usually about 12 volunteers come to help, although we can operate well with six."

Citizens who come in with household hazardous wastes are asked for identification and the number of households they have represented in their load so that the towns they are from can be billed properly. The program has devised a billing format that divides the cost three different ways. Each town pays a flat fee of slightly more than $4,000 to join the project. The other fees are based on population and distance from the site and are used to pay for operation and maintenance. As Benson says, "Of course, the larger towns wanted the fees based solely on usage and the smaller towns wanted it based on population, so we've used both equations. I think it's an equitable arrangement."

One-day collections often cost a town well over $50,000, whereas participation in the permanent facility ranges between $25,000 and $50,000 and provides weekly service seven months a year. The Water Authority predicts that the facility will have recovered its initial cost in four years; after that, they will only be paying for maintenance and operation costs. Tom Jackson maintains that the facility has been very well utilized, averaging about 150 carloads of waste per Saturday morning.

According to Benson, bringing in wastes is a relatively quick and easy procedure. Once a car enters the site's unloading area, trained technicians remove the substances from the vehicle. The whole process takes only 10 or 15 minutes, 30 to 40 during an unusually busy period.

"The program's continued success depends on education programs that are strong and continuous," says Leslie Lewis. The Water Authority puts information on the facility in billing inserts, yet it is also up to communities to encourage public awareness and participation. Lewis and Benson would both like to see household hazardous waste collection integrated into communities' current recycling programs. Already the DEP has been approached by five or six other regions interested in offering a similar program.

As Tom Jackson says, "We're hoping this will serve as a pilot project, demonstrating to other communities how a solution can be developed on a multi-community basis." ■

The permanent facility not only increases participation; it also reduces cost since the facility doesn't have to pay for disposing of partially filled containers of household hazardous materials.

The Natural Historian

American toad (Bufo americanus). (*Photos: T. Taigen*)

How Frogs Spend the Winter

by **Becky Bushnell**
Writing Intern,
UConn English Dept. &
Connecticut State Museum
of Natural History

Icy winds, heavy snowfall and bone-chilling temperatures are all familiar elements of winter in New England. For most people, these elements have the relatively benign effect of making the out-of-doors less comfortable, but for many animals the harsh conditions threaten their very survival. Both people and animals have developed similar strategies for enduring the winter weather. Some choose to fly south to warm climates, like many birds, while those that remain behind either bundle up in extra layers of insulation or hibernate, as many small mammals do. But there is one animal strategy that humans are completely unable to adopt: that of the resilient frogs, in which a portion of their bodies actually freezes solid!

In mid- to late-October frogs begin preparation for the long, cold winter ahead. Some species avoid the lethal sub-freezing temperatures by burrowing deep in the soil or into the bottom of a pond, whereas other species seek only a thin covering of leaves and moss. According to Dr. Ted Taigen, a physiological ecologist at the University of Connecticut, these terrestrial species are "literally built to freeze," allowing up to 50 percent of their bodies to become frozen.

Frogs are poikilothermic, or cold-blooded animals, meaning that their body temperature fluctuates with the temperature of the environment. Cold weather causes their activity to slow, and many frogs would be in danger of freezing to death if they did not seek refuge from extreme cold. The lower temperatures and shorter daylight hours of mid-autumn stimulate the internal biological clock, telling the frog that it's time to find shelter for the oncoming winter. But this in itself is a dilemma, as frogs cannot go south and do not produce the body heat necessary to warm a den.

Ponds and streams with muddy bottoms provide common wintering sites. Because water bodies freeze from the surface downward, ice rarely forms near the bottom where the frogs bury themselves. The northern leopard frog (*Rana pipiens pipiens*), the pickerel frog (*Rana palustris*), and the bullfrog (*Rana catesbiana*) all prefer to overwinter in these aquatic sites. The green frog (*Rana clamitans*), however, may burrow in either a terrestrial or an aquatic site, depending on the age of the individual.

Many of the frog species found in Connecticut pass the winter burrowed in the soil or under moss, leaves and rocks. This not only provides insulation from the cold, but also supplies the humidity necessary for survival. The eastern spadefoot toad (*Scaphiopus holbrooki*), the American toad (*Bufo americanus*),and the Fowler's toad (*Bufo woodhousei fowleri*) dig themselves into the soil below the frost line, sometimes to the depth of three feet. Other species, such as the northern spring peeper (*Hyla crucifer crucifer*) and the gray treefrog (*Hyla versicolor*), winter under tree roots, moss and leaves, whereas the wood frog (*Rana sylvatica*) prefers flooded meadows or damp forest floor litter.

Frogs have developed several special physiological adaptations which allow them to remain dormant for long periods of time. The cold temperatures cause them to cease all motion, and thus immobilized, all muscle activity comes to a halt, including heartbeat and respiration through the lungs. Gas exchange continues due to the ability of frogs, as well as other amphibians, to use dermal respiration or to breathe through the skin. During most of the year this dermal respiration is minimal, and lung respiration takes place, but due to the low energy requirements of winter dormancy, dermal respiration provides all necessary gas exchange. And according to Taigen, "There is no blood pressure, there is no blood flow... these animals are in suspended animation."

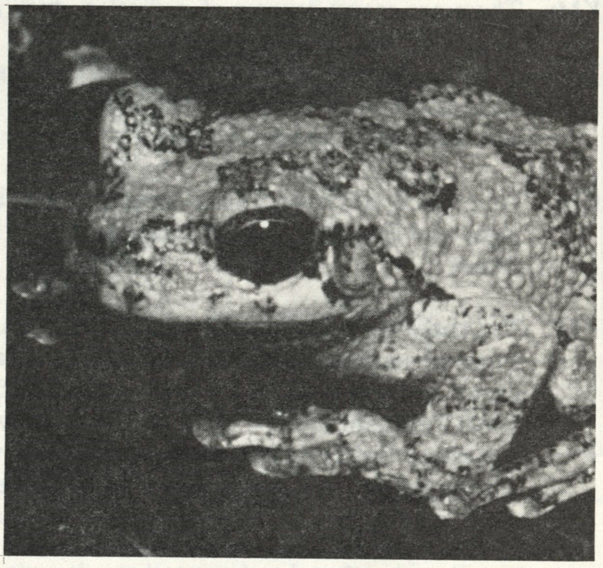
Three species of frogs have adapted even further to the extreme temperatures of northern winters. According to recent studies by K. Storey and W. Schmid, the gray treefrog, the northern spring peeper, and the wood frog can tolerate the formation of ice in their bodies. In their hibernation sites temperatures can drop as low as -5 to -7 degrees Celsius, and the hardiest frogs can survive short-term exposure to temperatures as low as -8 C. Ice crystals form in the abdomen and around the muscle fibers, but as long as the duration of freezing is short and the thawing is gradual the frog is likely to survive.

Frogs are able to produce their own natural anti-freeze system, called cytoprotectance, which works just like the anti-freeze people put into their cars. When ice begins to form in the frog's body, large amounts of glucose, a common sugar, are produced in the liver and released into the bloodstream. The gray treefrog produces glycerol instead of glucose, which works in the same way. These compounds are transported into the cells, where they lower the freezing point, preventing ice formation and damage to the fragile cell membranes and capillary walls. Studies by K. Storey showed that during freezing the glucose level in the wood frog's blood can soar to one hundred times normal.

The recent studies of frozen frogs not only have an impact on biology but also may have significance in the medical field. Once scientists fully understand the mechanisms by which ice damage to cells is prevented in frogs, they may be able to apply these methods to human cells. This would help, for instance, in better preservation of transplant organs so as to minimize ice damage and possibly lengthen the time that the organ can remain on ice outside the body.

Like a transplant patient who awakens from surgery with a "new life," the earth begins to come alive in spring, bringing with it the warm rains and rising temperatures that stimulate the frogs to emerge. And it is the sound of frogs calling on an early March evening that to us is a true harbinger of spring.

This article was contributed by the Connecticut State Museum of Natural History at The University of Connecticut in Storrs. The museum exhibits mounted birds of Connecticut, the largest mounted white shark on display in the eastern United States, "Videoplace" interactive video, and Indian artifacts and offers programs for teachers, children, and adults. For information, contact the museum at UConn, Box U-23, Storrs, CT 06269-3023; phone (203) 486-4460. ■



Gray treefrog (Hyla versicolor). *Note the toe pads.*

Northern spring peeper (Hyla crucifer crucifer).

The Long, The Short & The Safety of Radiation...

by

Robert Paier

The following interview, on Nuclear Energy, Nuclear Power Plants and Nuclear Radiation, was originally broadcast as part of the "Environment" TV series. Kevin McCarthy is the Director of the DEP's Radiation and Noise Control Division.

CE: I'd like to just start off right off the bat and ask you, what is radiation?

KM: There are many sources of radiation, such as the sun, tv transmitters, radio transmitters, etc. What radiation *is* is particles or energy which emanate from a source. This source is emitting this radiation, and we or other receptors receive it.

CE: And this is all kinds of radiation, for example sunlight and electricity, but nuclear radiation is different?

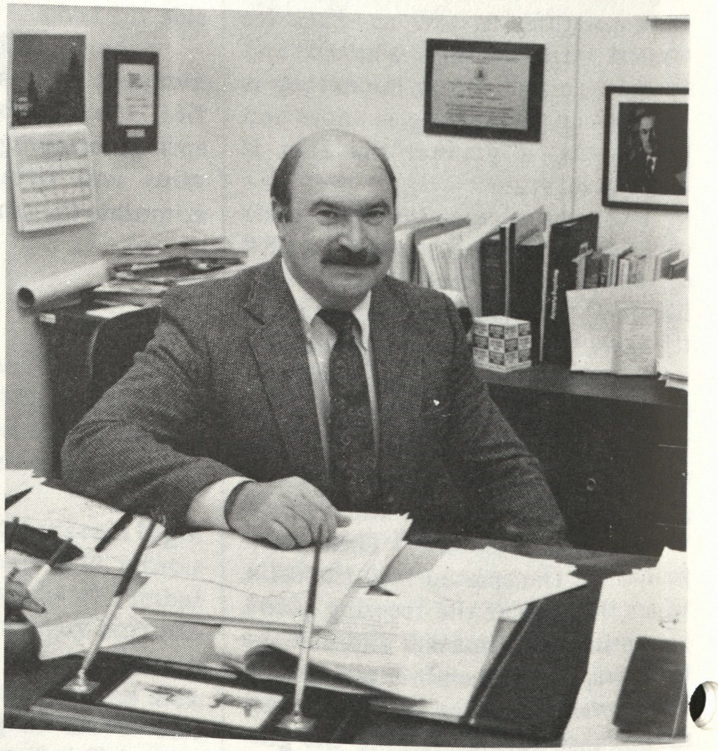
KM: Yes, there are many, many types of radiation. Some types of radiation we can see; light, for example. Other types of radiation we can feel; heat from a stove, for example. The types of radiation we cannot see or feel include radio waves ... radio waves are everywhere. You can take a short wave radio out to a desert island, turn it on, and if you have an antenna you will receive broadcast stations. That's a form of radiation we can't see or feel.

Then we have X-radiation, which is a radiation that physicians utilize to inspect the insides of our bodies. We also use x-rays in industrial settings to examine materials that we can't see through.

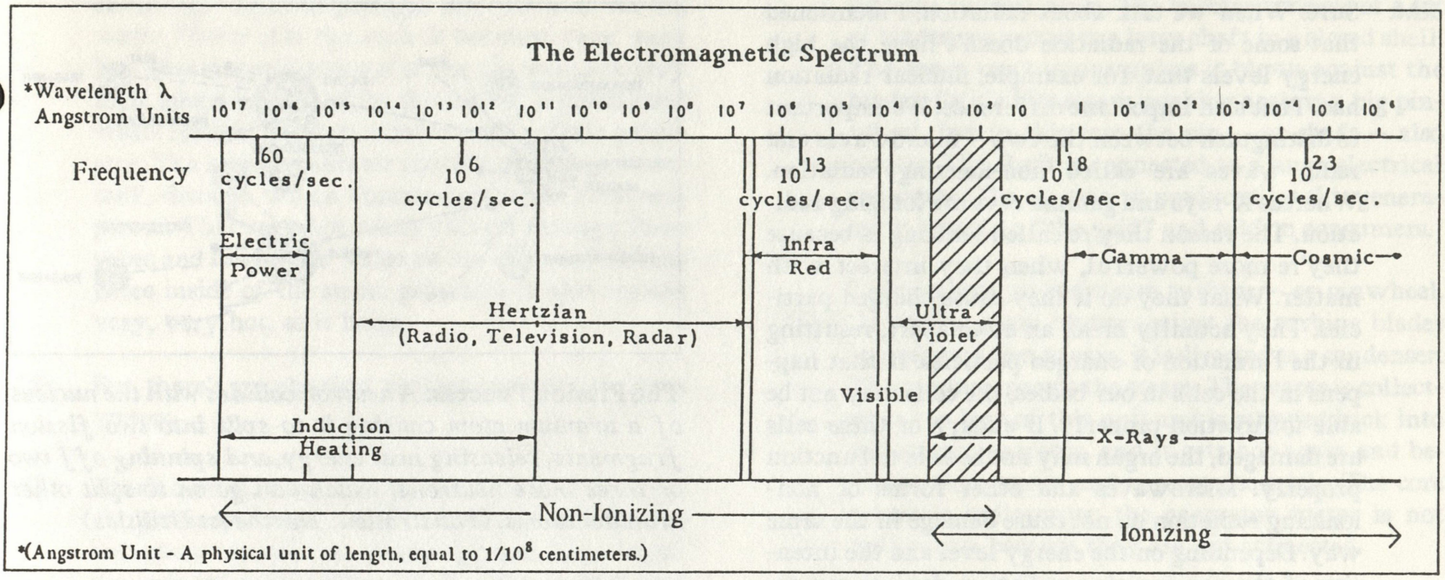
Nuclear radiation comes from the nucleus of some atoms. We know that the world is made up of atoms, atoms and molecules. The center of the atom is called the nucleus. The nuclei of certain, unstable atoms emit particles or pure energy from the nucleus. We call this nuclear radiation because it comes from the nucleus, or center, of an atom.

CE: And it's much more powerful than many other kinds of radiation?

KM: That's right. I mentioned radio waves earlier... radio waves are at the low end of the energy spectrum. Though, as a matter of fact, even below that we can talk about the radiation from power lines. The fields that are established from a 60 cycle power line are at the very, very low end of the spectrum. Then as we go through the spectrum we get to AM broadcast and beyond AM broadcast we get to short wave radio, then we get into television stations, ham radio frequencies, and so forth. As we approach the upper end of the spectrum, the energy associated with these waves becomes greater and greater. In other words, it's more energetic and eventually we get into the light spectrum and those electromagnetic waves are even higher in energy, and beyond that we get into nuclear radiation; gamma rays for example. X-rays are not really nuclear radiation but they are radiation in the same energy spectrum, the same area of energy as



Kevin McCarthy, Director of Department of Environmental Protection's Radiation and Noise Division. (Photo: Rosemary Gutbrod)


The Electromagnetic Spectrum

*(Angstrom Unit - A physical unit of length, equal to 1/10^8 centimeters.)

(From The Radiologic Health Handbook)

the gamma rays. The higher you go in energy, the more powerful and more penetrating the wave.

CE: I think a lot of people are surprised to find out that we are constantly being bombarded -- I don't know if that's the correct word.

KM: Yes, it is, by not only nuclear but all types of radiation. We're in a sea of radiation. If we could put special glasses on that could show this radiation, it would be coming from building materials -- that would be the nuclear radiation. It would be showering from the sky in the form of cosmic radiation. It would be coming from the ground (we all have heard about radon). Radon comes from radium which comes from uranium, and that's in the ground. Some building materials have uranium in them. So we are really awash in radiation.

CE: All right, so we are bombarded with naturally occurring radiation but also sometimes we try to create radiation. How do we do that?

KM: That's correct. Well, take cobalt 60. We use cobalt 60 for the treatment of cancer and for many many other things as well. There is no naturally occurring cobalt 60. What we do is we put cobalt 59, which is the naturally occurring, the stable kind of cobalt, in a reactor and we bombard these atoms of cobalt 59 with neutrons. Neutrons are readily available in a nuclear reactor, and we bombard this cobalt 59 with neutrons and it becomes cobalt 60, which is quite radioactive. Then we extract this cobalt 60 from the reactor and use it for various purposes.

CE: OK, so there are various purposes for which it can be used positively. But there are dangers also with radiation.

KM: Absolutely. You know, when we talk about radiation, the radiation that I spoke of earlier, that too much sun causes skin burns. Too much light in our eyes can cause problems with our eyes. Too much radiation, especially with nuclear radiation and X-rays, can indeed cause harmful effects. The key is the amount. As long as we do not allow ourselves to become exposed to excessive amounts, we shouldn't have a problem. With naturally occurring radiation, we're exposed here in Connecticut on the average to about 100 to 125 millirems per year. Whether we like it or not. If we include exposure to radon, the exposure from naturally occuring radiation is as high as 300 millirems annually. Even if we encased ourselves in some relatively thick material, we'd still be exposed to radiation. Some of it is showering down from the heavens, some coming from the ground.

CE: Having established the dangerous aspect of radiation, I'll go to the next question. What is your mission as Director of the Radiation and Noise Control Division?

KM: Well, our basic mission is to ensure that the public and workers are not exposed to radiation that they shouldn't be exposed to, excessive radiation. This applies to people who work in hospitals and research facilities and those who work in industrial settings where they utilize radioactive material and industrial x-ray machines. We also are charged with ensuring that there is no build-up of radioactivity in the environment. The division also ensures that radioactive waste is handled and disposed of properly.

CE: You mentioned that it is important to distinguish between ionizing and non-ionizing radiation. Could you explain that?

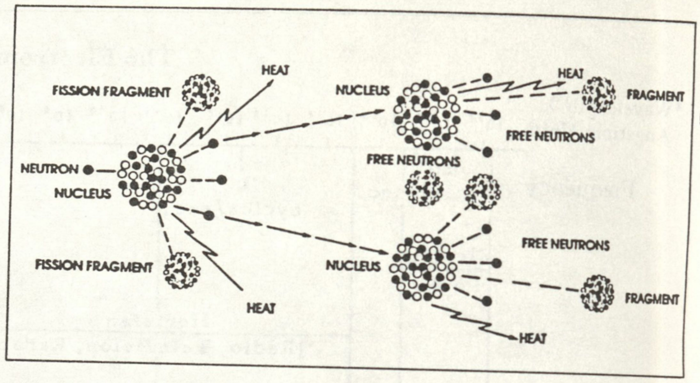
KM: Sure. When we talk about radiation, I mentioned that some of the radiation doesn't have the high energy levels that, for example, nuclear radiation has. That's an important difference. It's important to distinguish between the two — microwaves and radio waves are called non-ionizing radiation. Whereas X-rays and gamma rays are ionizing radiation. The reason they're called ionizing is because they're more powerful, when they interact with matter. What they do is they cause charged particles. They actually break an atom apart, resulting in the formation of charged particles. If that happens in the cells in our bodies, the cells may not be able to function properly. If enough of these cells are damaged, the organ may not be able to function properly. Microwaves and other forms of non-ionizing radiation do not cause damage in the same way. Depending on the energy level and the intensity of the non-ionizing radiation, damage can occur. This type of radiation does not cause the target atoms to break apart and form charged particles, and that's a significant difference.

CE: And that's why ionizing radiation must be monitored and regulated as it is.

KM: All radiation should be, but nuclear or ionizing radiation to a greater extent. We talked about nuclear radiation versus, for example, X-radiation. X-radiation or X-rays are a machine-produced radiation. In other words, you turn the machine on and you turn the machine off. When the device is turned off, the X-rays are no longer produced or generated. In the case of nuclear radiation, however, you can't just turn it off. Radioactive material remains radioactive until it goes through its normal life and eventually loses virtually all of its energy and is no longer considered radioactive. Each radioactive species has its own characteristic life, or more correctly its half-life. This term, half-life, is used to determine how long it will take for the radioactive species to become stable.

CE: Now I know one of the things you monitor very closely is the nuclear power plants in Connecticut. You told me that the basic reaction in the nuclear power plants is fission. Would you explain that?

KM: That's correct. In the fission reaction we have a neutron coming in and interacting with a particular type of atom. The interaction with the neutron causes the target atom to split or fission. In the case of nuclear power plants, the target atom is uranium 235. So the U235 receives a neutron. Now U235 is very unhappy when it receives a neutron because it then becomes uranium 236, and uranium 236 doesn't really want to exist. So what happens is, it splits apart or fissions. The two pieces of the original uranium atom fly apart. The two pieces are called fission fragments, and there's a lot of heat generated each time an atom of U235 undergoes this fissioning process. Each time this reaction occurs, additional neutrons are released. In other words, we have the two fission fragments flying apart, crashing into adjacent atoms at the same time additional neutrons are being released by the target atoms. These neutrons cause additional fissions to occur.



The Fission Process: *A neutron collides with the nucleus of a uranium atom causing it to split into two fission fragments, releasing heat energy, and spinning off two or three more neutrons, which can go on to split other uranium atoms. (Illustration: Northeast Utilities)*

CE: That's the chain reaction.

KM: Yes. And within microseconds, we have a tremendous number of free neutrons causing additional fissioning. And that's where we get the heat from. Every time a fission occurs, we get a little bit of heat. But if we have billions and billions of these reactions going on, that little bit of heat from each one adds up to a lot of heat, and it's this heat that actually heats the water in a nuclear reactor, causes the water to become steam, and the steam goes on to turn the turbine.

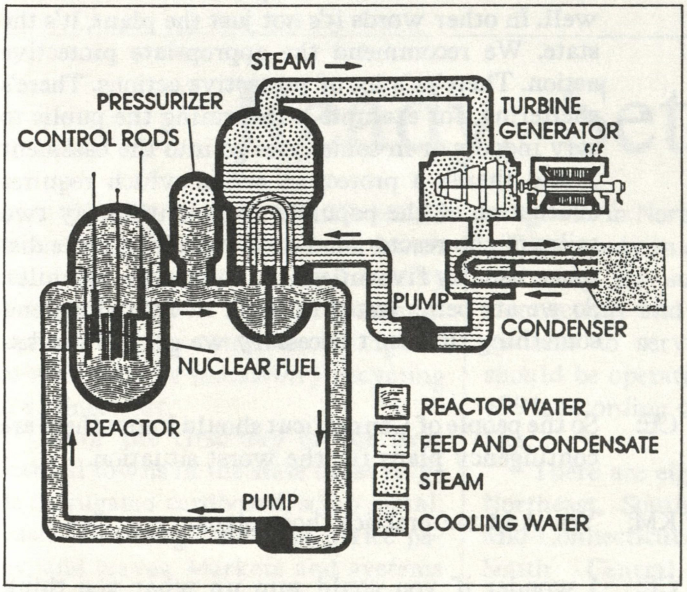
CE: If this reaction is controlled, that's the point.

KM: Yes, it must be controlled. And the way it's controlled, at a nuclear power plant, is with water, water additives, and control rods. The water itself is used as a moderator. In some cases, additives are used. Control rods are also an integral part of any commercial nuclear power plant. So it's all three. The water itself, additives, and the control rods in a nuclear power plant.

We talked about fissioning, where these atoms undergo the breaking apart or splitting. Every time they break apart, a little bit of heat is given off. All of that occurs in the plant's core. In the core of the pressure vessel is where we have this fissioning occurring. Water is pumped into the core. As the water flows into the core it becomes very, very hot. This water flows out of the core area at a very high temperature and, in the case of a pressurized water reactor, through what we call a steam generator. The steam generator consists of a large water tank, through which thousands of tubes have been placed. This very hot water travels through these tubes and causes the water on the other side of the tubes inside of the steam generator to also become very, very hot, so it boils.

CE: But there's no physical contact between the two waters.

KM: That's correct, there is no physical contact between the primary water, which is radioactive, and the secondary water. A pump pushes this water through the radioactive core; it gets very hot, goes through the steam generator tubes -- there are thousands of them in the steam generator -- and then back. It's a closed loop. So the water on the other side of these tiny tubes becomes very hot, actually gets so hot that boiling occurs right at the surface of the tubes. It's these steam bubbles that eventually leave the steam generator and are piped into the turbine room. The turbine consists of a lot of blades connected to a large shaft in a closed shell. The steam can't escape unless it blows against the blades. So it's like steam pushing against a big pinwheel, but in this case the pin -- or shaft -- also rotates. The shaft is connected to a huge electrical generator. The electricity produced by this generator is wired to "the grid" and sold to consumers.



Pressurized Water Reactor: *In a PWR, the water flowing through the reactor is heated under pressure to keep it from boiling. This "primary system" water flows to steam generators where its heat is transferred through the walls of tubes to another body of water the "secondary system," which is allowed to boil. The resulting steam drives the turbine which spins a generator and produces electricity. The steam leaves the turbine and passes into a condenser where it is cooled and changed back into water. Pumps return the secondary system water to the steam generator for reheating and reuse in the cycle. (Illustration: Northeast Utilities)*

Let's go back to the steam turbine -- or pinwheel. After the steam blows against the turbine blades and causes them to spin, it is directed to a condenser. The condenser cools the steam. The water is collected at the base of this unit and is pumped back into the steam generator, and it gets hot again and becomes more steam and repeats the cycle. The core water is radioactive; the generator water is not radioactive because they are not connected.

CE: So the purpose of a nuclear power plant, really, is to boil water.

KM: Exactly. Instead of a coal-fired plant or an oil-fired plant, we use the fission process, a controlled process, to heat water. The hot water eventually produces steam, in this case on the secondary side. The resulting steam is used in the same way that it would be used in an oil or coal power plant. There are other types of nuclear reactors that utilize the radioactive steam directly. By the way, the reason the primary water doesn't also boil is because it is under high pressure.

CE: What plants do we have here in Connecticut?

KM: At Millstone in Waterford we have a boiling water reactor and two pressurized water reactors. The Haddam Neck Plant, located in Haddam, close to the Connecticut River, is a pressurized water reactor. So we have a total of four reactors, one of which is a boiling water reactor. Boiling water reactors are much simpler than pressurized water reactors. The steam is produced in the core and is applied to the turbine directly. The water-steam cycle operates at much lower pressures.

CE: As Director of the Radiation and Noise Control Division, your day to day activity involves enforcing regulations and monitoring. But another significant part of your responsibility is emergency response. What kind of things go wrong?

KM: Many things can, and do, go wrong. The division prepares for and responds to all sorts of incidents and accidents that involve radioactive materials. Incidents including illegal dumping of radioactive waste, transportation accidents involving radiopharmaceuticals and other radioactive materials, severe contamination incidents at universities, and contamination incidents and releases of radioactive gases at nuclear power plants have occurred here in Connecticut.

CE: These are radioactive?

KM: Yes, all these incidents involved radioactive materials. I'll give you an example of a transportation accident that I responded to. At 3 a.m. the State Police dispatcher called my home. The dispatcher informed me that "a van carrying radioactive materials eastbound on I-95 in the New Haven area has just spun out of control and packages bearing radioactive labels have been thrown all over the highway. The highway has been blocked at the exits on both sides of the accident. The driver has been injured and is on the way to the hospital. Traffic has been diverted and is backing up. When can you get here to clean this mess up? We have people at the scene waiting for you."

In that situation, we would normally dispatch the nearest person from our unit to that particular scene. Typically the police and fire department are the first people on the scene. Because it's they who are called in the event of any type of accident. When we arrive, we evaluate the situation, if there are injuries involved we advise the health professionals on the scene so we minimize contamination, we manage, if you will, the problem.

At a recent problem at the airport, we had a radioactive package that was being carried on a forklift, and the driver of the forklift didn't notice that the package fell off the forklift, and he drove over it. It was a radio-pharmaceutical package. He flattened the package, and there was contamination of the floor and of the vehicle, and we had to decontanimate. We're also involved in responding to nuclear power plant incidents and accidents, and we practice that phase frequently. That's why we have drills and exercises.

CE: You were very kind in allowing us to get inside Millstone when they recently had a drill that was important as far as their Nuclear Regulatory Commission (N.R.C.) standing. Could you explain a little bit about that?

KM: Sure. Each plant, in order to maintain its license, must go through this exercise process. They have several drills throughout the year. At least once a year, each power plant involves all external agencies, including the state, including local communities, and they demonstrate their ability to manage a nuclear incident.

CE: It's like a war game, right?

KM: Yes, it is. As a matter of fact, they usually simulate a core melt, a loss of cooling accident. Which is one of the worst possible accidents.

CE: You explained what cooling was ...

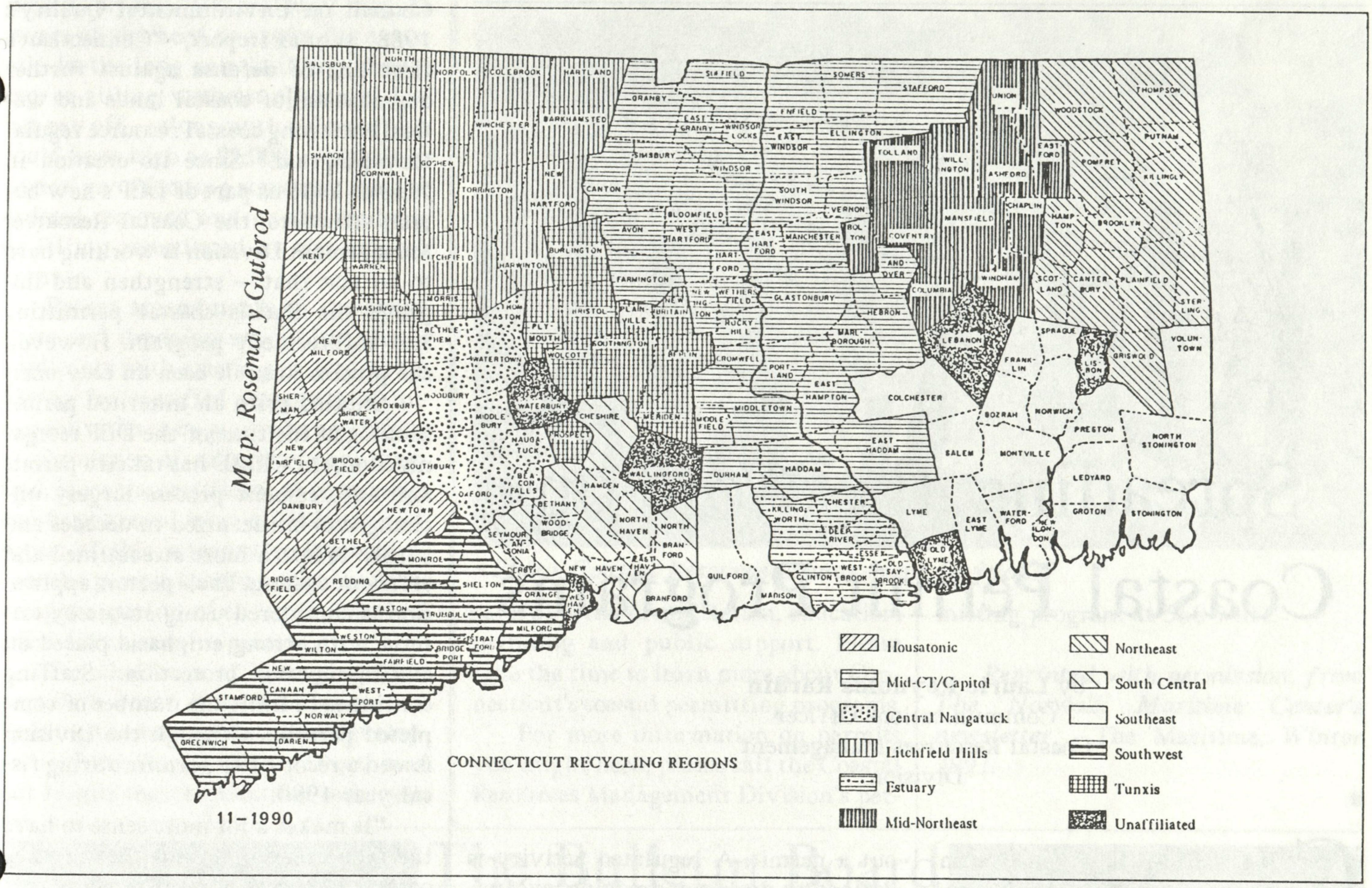
KM: Yes, coolant is the water which flows through the core. That water is extracting heat from the core. Now let's say a pipe breaks -- and usually what they simulate is a double-ended break, which means a section of pipe just falls out. Now if a section of pipe falls out, they lose coolant and you can't even return water if you can get it elsewhere because you just can't feed water to the core. In that case you'd have the so-called China syndrome effect. The meltdown. But really we don't have that kind of effect, though it's a great story for the movies. But we have seen significant core damage ... at Three Mile Island, for example. There's very very significant core damage. They could not get enough water into the core in time to keep it cool. That's the kind of an accident ... not the TMI accident but even worse than that ... that we practice. We assume that there has indeed been a release because those outside the plant are exercised as well. In other words it's not just the plant, it's the state. We recommend the appropriate protective action. There're a lot of protective actions. There's sheltering, for example ... informing the public to stay indoors or in some cases go into the basement ... and there's a protective action which requires evacuation of the populace from within say two miles of the reactor, and downwind for some distance, usually five miles or in some cases ten miles. So we are being tested as well. If we recommend something that isn't necessary we get bad marks.

CE: So the people of Connecticut should know there are contingency plans for the worst situation.

KM: Yes. And we practice those plans.

CE: I wonder if you could sum up what you think people should know about nuclear energy.

KM: I think the most important thing the average citizen should do is learn more about it. As he or she should learn about all of these things. Radon, for example ... to know more about radon and how to protect yourself, learn more about it. The same applies to nuclear power. The same applies to X-ray machines ... if you're having an X-ray examination, find out why? If you're in an industrial setting that uses radioactive material, find out more so you indeed can protect yourself. ■



Ready, Set.. Recycle!

ALL TOWNS IN THE STATE MUST be ready to process most of the State's list of nine mandatory recyclables by January 1, 1991. The 1990 amendments to the Mandatory Recycling Act do not postpone mandatory recycling in Connecticut.

As of the first day of the new year, all towns in the state must recycle corrugated cardboard, scrap metal, waste oil, storage batteries, office paper, and leaves. Markets and systems such as leaf composting for handling all these materials are available. (PA 90-220 repealed a ban on landfills' and resource recovery facilities' accepting any of the designated recyclables.)

Newspapers and glass and metal food containers must be recycled as soon as intermediate processing centers (IPCs) are available in those recycling regions that plan to use them.

Intermediate processing centers in the Southeastern and Southwestern regions of the state as well as municipal programs in Northeastern Connecticut will be ready in early 1991; IPCs will be ready by summer in the Mid-Connecticut and Tunxis regions; and systems to serve the other regions should be operating before the end of 1991, according to DEP's recycling office.

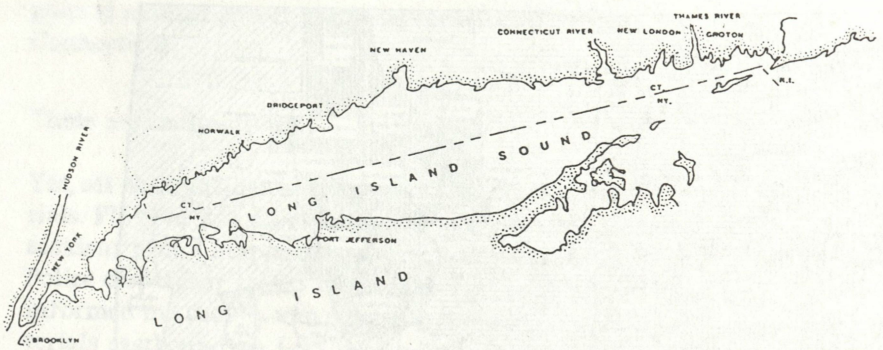
There are eight recycling regions: Northeast, Southeast, Mid-Northeast, Mid-Connecticut/Capitol, Tunxis, South Central, Housatonic, and Southwest. The Mid-Connecticut/Capitol Region is the largest, encompassing over a million people and towns in the Estuary, Mid-State, Central Naugatuck, and Litchfield Hills areas as well as the Capitol Region.

The Northeast Region is the smallest, encompassing 12 towns and fewer than 100,000 people. Only a handful of towns are not yet participating in a recycling region: Lebanon, Lisbon, Old Lyme, Voluntown, Wallingford, Waterbury, and West Haven.

IPCs for bottles, cans and recyclable paper will serve seven of the recycling regions. The Northeast Region, due to its small population, rural character, and nearness to markets, does not require an IPC, but member towns are setting up municipal recycling programs.

By New Year's Day, 1991, towns must also have ordinances governing recycling by all waste generators and must have named town recycling contacts. Towns must report progress to DEP July 1, 1991.

With the recent approval of funding for seven projects, only $3.0 million of the $26.8 million originally authorized for recycling programs will remain, and every region in the state will have received substantial funding for capital purchases such as recycling and composting facilities, recycling collection vehicles, household recycling containers, and composting equipment. ■



Spreading the Word on Coastal Permit Programs

by **Laurie Reynolds Rardin**
Communications Officer
Coastal Resources Management
Division

CHANCES ARE, if you live on or near the coast, own coastal property, or are interested in protecting the shoreline, you are also interested in the permit program administered by the Coastal Resources Management Division (CRMD) of DEP's Bureau of Water Management. "You may need a permit!" is the word being spread by the Division to let the public know the facts regarding the need to obtain a permit before doing any work waterward of the high tide line.

Specifically, the CRMD has ongoing statutory responsibility to administer the tidal wetlands and the structures, dredging and fill regulatory programs. As stated in the Structures, Dredging and Fill Statute (C.G.S. 22a-359 - 22a-363), a permit must be obtained by anyone who undertakes dredging, erects a structure or places any fill, obstruction or encroachment, or carries out work incidental to the above, in the tidal, coastal or navigable waters of the state, waterward of the high tide line.

Similarly, The Tidal Wetlands Act (C.G.S. 22a-28 - 22a-35) stipulates that no person shall conduct a regulated activity on any tidal wetland without a permit. A regulated activity is defined as draining, dredging, excavation, or removal of vegetation, soil or other material from a wetland, or the dumping, filling or depositing of any material into a wetland. Additionally, the erection of structures, driving of pilings, or placement of obstructions also requires a permit.

The first coastal permitting program in Connecticut was established in 1939. Passed to address the lack of regulation governing the construction of shoreline structures, the 1939 law stands as the foundation for the current Structures, Dredging and Fill Statute. The latter, along with Connecticut's Coastal Management Act and the Tidal Wetlands Act, have established Connecticut as a pioneer in the effort to protect tideland resources for the benefit of the public. Today, this emphasis is the centerpiece of the coastal management program and is further manifested in the Public Trust Doctrine -- the body of common law which states that the lands, waters and marine life waterward of the mean high tide line are owned by the State and held in trust for the public.

As stated in the Connecticut Council on Environmental Quality's 1988 annual report, "Connecticut's first line of defense against further degradation [of coastal lands and waters] is a strong coastal resource regulatory program." Since its creation in June of 1988 as part of DEP's new bureau structure, the Coastal Resources Management Division is working hard to do just that -- strengthen and improve the State's coastal permitting and enforcement program. However, the process has not been an easy one.

Saddled with an inherited permit backlog at the time of the DEP reorganization, the CRMD has taken a permit and enforcement process largely unchanged or modernized in decades and turned it into a more streamlined and efficient system. Each permit application is considered using statutory criteria with strong emphasis placed on environmental protection. Staffing continues to limit the number of completed permits, although the Division issued a record 145 permits during fiscal year 1990.

"It makes a lot more sense to have the regulatory programs that involve coastal resources administered as part of the whole coastal management program," says Arthur J. Rocque, Jr., Director of the Coastal Resources Management Division. "With the environmental review, coastal planning, and permit staff all under one roof, and all water functions in one bureau, we're making better, more consistent permit decisions."

Adrian P. Freund, Chief of the Bureau of Water Management, notes that CRMD is one of the few divisions in the bureau with a declining permit backlog. He hopes to further reduce the processing time for coastal permit applications.

Enforcement of permit violations has also improved. Site inspections take place on a regular basis. Stiffer fines and penalties are being imposed with the full support of the Attorney General. During fiscal year 1990 the Division successfully initiated 27 enforcement actions, another record for these permit programs.

Nevertheless, the length of time required for a permit application to be reviewed and processed tempts many potential applicants to circumvent the permit process. Others may not be aware of the need to apply for a permit. In the long run, building, dredging, or filling without a permit does not pay off -- along with a fine which could be as high as $1,000 a day, all or part of an offending structure may be ordered removed and/or the dredging or filling remediated at the owner's expense.

Recent amendments to the structures and dredging act allow permit applicants with existing structures applying for specified categories of minor activities to be granted a certificate of permission if all criteria are satisfied. Since the certificate of permission can be processed more quickly, the addition of this category is expected to ease the permit backlog without lowering the quality of environmental review for the entire process.

The challenge of managing Connecticut's coast is not an easy one. Striking the balance between development of the shoreline and protection of our fragile coastal resources requires a careful blend of regulation, education, planning and public support. Please take the time to learn more about Connecticut's coastal permitting programs.

For more information on permits you might need, please call the Coastal Resources Management Division's permitting program at 566-7404.

(Photo: Coastal Resource Management Division)

Reprinted, with permission, from The Norwalk Maritime Center's newsletter, The Maritime, *Winter 1991.* ■

The Bulletin Board

Land Ethic Workshop

Connecticut's new forest stewardship committee will offer a land ethic workshop on February 25th and 26th, 1991, at the "Hemlocks" in Hebron.

The purpose of the two-day workshop for environmental professionals is to develop a "land ethic" for the State of Connecticut and to form coalitions among state conservation organizations.

The U. S. Forest Service began this new program for non-industrial private forest landowners. In Connecticut, the Division of Forestry has formed a committee of D.E.P. foresters and wildlife biologists, private forestry consultants, environmental educators, extension foresters, soil and water conservationists and others to study the needs of forest landowners in the state and develop a program to fill these needs.

Landowners with as little as one acre of wooded land will be included in the program. It is geared not toward timber production but toward other management goals such as wildlife habitat, recreation, and forest diversity.

A brochure on the workshop, as well as further information on the Stewardship program, is available from Fred Borman, Urban Forester, Connecticut Division of Forestry, 165 Capitol Ave., Rm. 260, Hartford, CT 06106; 566-5348.

Guides Have New Look

The annual hunting and trapping field guide and the anglers' guide are at Connecticut Town Clerks' offices. The guides, which provide information on seasons, fees, bag limits, and other regulations relating to hunting and fishing, have a new look for 1991.

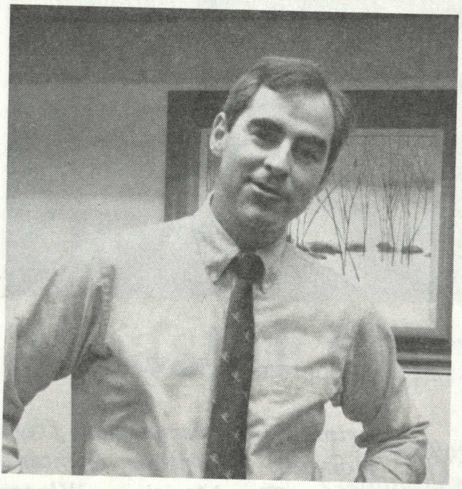
Both new guides are printed on newsprint, as 24-page booklets. Both include advertising. This year advertising sales offset about 15 percent of the guides' production costs, and it is expected that advertising sales for the 1992 guides will reduce the D.E.P.'s costs for the guides even further.

Dinosaur State Park

Saturday, February 16, 1:00 p.m. "Winter Trees," slide talk and nature walk on Dinosaur State Park nature trails. Dress for the weather. Free with exhibit center admission of $2 for adults, $1 for youths 6 to 17. West Street, Rocky Hill; 529-8423.

Tuesday, February 19, 7:30 p.m. "The Challenges of Reconstructing *Allosaurus*"; Robert Allen, Associate of Research, Peabody Museum of Natural History, Yale University. Allen will trace the history of how a tangle of *Allosaurus* bones is being reconstructed. Admission: $2.50; free for Friends of Dinosaur Park members. ■

DEP Divisions Get New Directors



(Photos: Rosemary Gutbrod)

Inland Water Resources Management

One way to handle life's slippery slopes is to ski on them. Tom Morrissey says so. As he tells the story, he smiles: "I was a freshman at the University of Colorado. The country is stunning. I fell in love with skiing. In fact, I left college after one semester and skiied for the next four years!"

Then reality returned.

Thomas M. Morrissey, new director of the Bureau of Water Management's Inland Water Resources Management Division, returned east. He attended the University of Connecticut, got a Bachelor of Science degree in civil engineering.

He became a DEP employee. He has been a state employee for 12 years, serving in the water compliance unit until his current appointment.

Tom, 37, was born in New Haven and lived in Hamden for many years. He now lives in Cheshire with his wife, the former Kate Rogan, and their two children, Owen and Caitland.

To relax? "I'm an avid cross-country skier," says Tom. "And I do that a lot. Yes, I've been back to Colorado. With my family. We hike. Beautiful country. A few weeks ... not four years."

Waste Engineering/Enforcement

If you want to look out of a Hartford office window and see Southern California, try memories.

Says David A. Nash:

"I can still see the University of Southern California campus. It's an exciting, inspiring university. That's where I studied toward my Master's degree in public administration. I took a unique, 15-semester-hour course there."

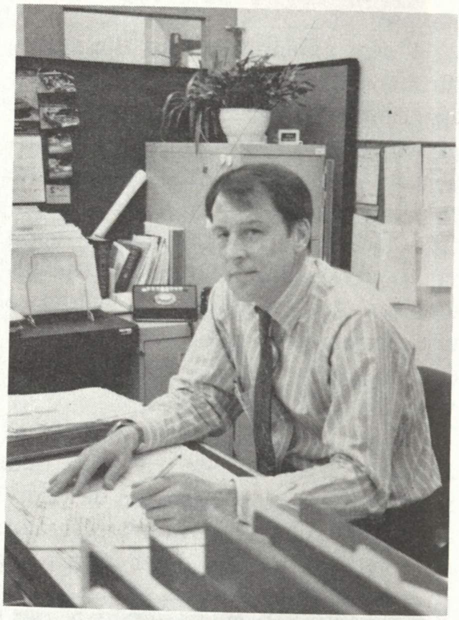
Today Nash has new duties. He is the new director of the Waste Engineering & Enforcement Division, in DEP's Bureau of Waste Management. The division comprises engineering and enforcement activities for both solid and hazardous waste.

Nash, 41, has a Bachelor's degree in biology from Central Connecticut State University.

He started working for the state in September, 1973, as an air pollution engineer. More recently, he formed the air program's enforcement section.

"For the last eight or nine years I haven't had time for hobbies. Been too busy. Before then, I played softball, liked bowling," says Nash.

He and his wife, the former Kathleen Roberts, live in Meriden, Nash's hometown.



Air Engineering & Enforcement

Repaying a scholarship with interest is fine. Repaying with performance is even better.

Steven E. Peplau is a good example. In 1976, he got an EPA Fellowship Grant, one of only 10 in the USA for graduate study. Today he is filling a new position: Director of Engineering & Enforcement, Bureau of Air Management.

Peplau, 40, received a B.S. in Natural Resource Management from the University of Connecticut in 1972. He also earned a Master's Degree in Business Administration at the Hartford branch of Rensselaer Polytechnic Institute in 1983.

Peplau joined the DEP's Air Compliance Unit in 1973. The division he now heads enforces air regulations and issues new source permits.

Peplau, New Britain native, is married to the former Gail Suprin. They have two children and live in Berlin.

Hobby? "Auto racing," says Peplau. "At one time I was a crew chief for my brother-in-law." ■

Trailside Botanizer

Marginal or Evergreen Wood Fern

by
Gale W. Carter
Illustration
Pamela Carter

During the winter months evergreen wood ferns are one of the few bits of greenery in an oak woods. They appear in scattered groups, usually with six or more sturdy leaves in a each clump.

Each leaf stalk, or stipe, is grooved in front and covered with numerous chestnut colored, paper-like scales. The woody rootstalk reveals the basal remains of fronds of previous seasons. The rootstalk of this species resembles that of ancient tree ferns.

During the late summer months, new tightly coiled leaf buds (croziers) form a rounded clump. After the winter months, when warm weather approaches, the croziers begin to partially unroll to form fiddleheads. It is at this time that the sori, or fruit dots, develop. They appear along the margins of the leaflets and are covered by a kidney-shaped membrane called the indusium.

In the spring the indusium appears nearly colorless, but eventually changes to brown as the numerous spore cases inside the fruit dots ripen in July or August.

As the year progresses the undersurface of the fertile fronds become covered with these sori. Each sorus contains many spore cases where hundreds of tiny spores develop. Sterile fronds lack this characteristic.

Evergreen wood ferns grow well in a variety of sites at various altitudes. They are often found in woodlands where the terrain is rocky and there is at least partial shade.

The genus name *Dryopteris* is from the Greek drys, "oak," and pteris, "fern." The common and species names describe the location of the fruit dots on the margin of the leaflets.

The rhizome and stipe have value medicinally. They contain oleoresins, resins mixed with oils, that can be easily vaporized. These resins have value in paralyzing the contractile tissue of tapeworms. In this state, the worms can be flushed from the intestine.

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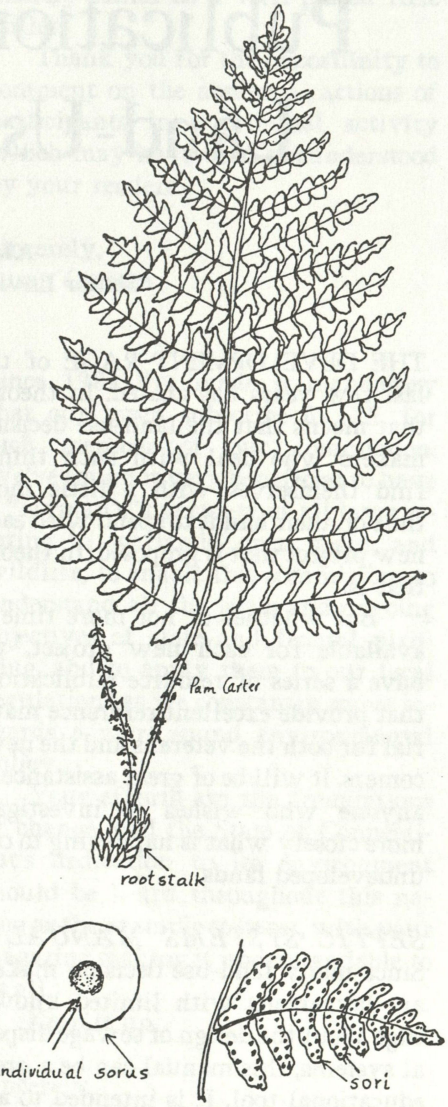


Updated River Guide

The Connecticut River Watershed Council and Embassy Marine Publishing have released the second edition of the popular *The Complete Boating Guide to the Connecticut River*.

This second edition has been updated with months of on-the river research and provides the most up-to-date Connecticut River information available. Accompanying the text are 32 maps of the river showing roads, towns, access areas and places of interest.

This guide divides the river into sections, with mile-by-mile descriptions of everything to look for and look out for while on the river, as well as complete listings of all the marinas, camping areas, picnic sites, boat ramps and access points on the river.

The Complete Boating Guide is also packed with feature articles on everything from history and river trivia to geology and the environment.

Finally, introductory chapters on fishing and birding as well as ecology and water quality will leave every boater with a new and better understanding of the Connecticut River.

The price for the Boating Guide is $11.95 per book, plus 8 percent sales tax and $1.60 per book for shipping. Send your order and check to: CRWC, 125 Combs Road, Easthampton, MA 01027 or call 584-0057 for an order form. Please allow two weeks for delivery.

The Connecticut River Watershed Council is a membership-supported non-profit conservation organization. Proceeds from the sale of the guide help fund the Council's river protection efforts thoroughout the Connecticut River Valley. ■

Map of the Month

Publications Help With Land-Use Decisions

by

Alan Levere
Senior Environmental Analyst

THE DEVELOPMENT RAGE of the last few years has abated. In theory, that means that the land-use decision makers who deal with such things find themselves with a little more time on their hands to spend with each new project that is proposed. In theory that is.

But whether or not more time is available for each new project, we have a series of resource publications that provide excellent reference material for both the veterans and the newcomers. It will be of great assistance to anyone who wishes to investigate more closely what is happening to our undeveloped lands.

SEPTIC SYSTEMS MANUAL ... Since many land-use decision makers are laypersons with limited knowledge about the design of sewage disposal systems, this manual can be a great educational tool. It is intended to answer the questions that might arise for those not familiar with the workings of a septic system. While not everyone may know how such a system works, it is fairly common knowledge that failing septics can cause a multitude of water quality and public health problems.

The manual's seven chapters cover: the components of the septic system, how large the leaching system should be, the hydrogeologic setting of the site, installation and operation, a discussion about possible pollution, and where to get additional information if needed. Diagrams of various septic systems and the preferred methods of installation are included. 37 pages, $3.00.

SITE PLAN REVIEW ... Frequently, in the past, many parcels of land were treated the same regarding their development. But the real cost of some development projects was only realized years later when sewer lines had to be extended to replace ailing septic systems; when soils from steep and eroded, non-vegetated hillsides clogged streams and wetlands; when industrial lagoons and landfills were located literally on top of water supply aquifers; and when low lying housing experienced flooding which ended up costing taxpayers hundreds of thousands of dollars to remedy with flood control projects.

While land-use decisions have improved vastly over the last few years, it remains important for communities to consider the natural resource limitations of each site.

The manual is divided into two separate parts. The first part is six chapters of descriptive text. The second lists pertinent questions about: the viability of future expansion of sewer and water services, on-site water supply, on-site septic systems, site development, road networks and resources protection, and compatibility of surrounding land uses.

In all, the manual provides a systematic and comprehensive method for making enlightened development decisions. 42 pages, $3.00.

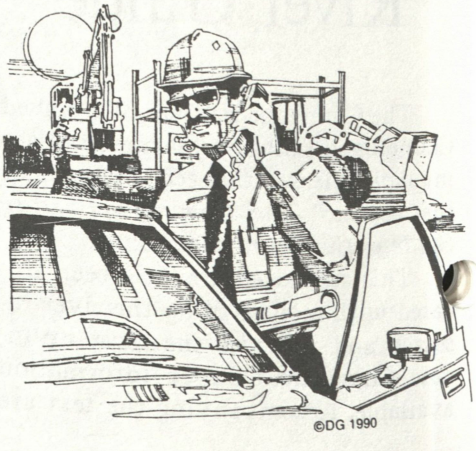
PROTECTING CONNECTICUT'S GROUNDWATER ... Connecticut is fortunate in usually having an ample supply of fresh water, from both surface and ground water sources. For the most part quantity is not the question; most often the emphasis is on the quality.

Many types of pollutants that cannot be cleaned up naturally by the soil can become serious drinking water hazards. Even when the pollutants can be properly identified the restoration of groundwater quality is often very slow and very costly. With about one third of the state's population relying on ground water for drinking water, quality is a critical issue.

With all of this in mind, this manual becomes a planning document which begins to explore what groundwater is, what pollutes it, where it needs to be protected, what has already been done to protect it, and, most important, what local communities can begin to do to identify and further protect the ground water which they may need for future drinking water supplies. Includes a section on the preferred hierarchy of land uses over regionally significant aquifers. 97 pages, $5.00.

Alright, so there never is any extra time to catch up; still this series of land-use documents makes a handy collection of information when it is time for reference and research. Keep it in in mind.

To order, please include eight percent state sales tax and $2.00 for handling per order (not per item). Our address is: DEP-NRC, Map sales, Room 555, 165 Capitol Avenue, Hartford, CT 06106. ■



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The Night Sky

January Offers Bright Lights

by
Francine Jackson

HAPPY NEW YEAR! CAN IT really be true? 1990 is actually gone, taking with it the tired old 80's, and finally giving us the real 1990's. And, of course, with the beginning of the year come the long, cold nights of winter, with, I might add, a few planetary interlopers thrown in to make the sky a little more interesting.

We have (November) already spoken of Mars, which showed itself in its best light until the next millenium. Coming closer than 50 million miles to Earth, Mars was the brilliant object traipsing through the constellation Taurus, the Bull. Although its distance from us is steadily increasing, and its brightness is hence decreasing, Mars is still easy to spot amid the beautiful winter stars.

Taking Mars' place in the sky will be Jupiter, the largest planet in our known system. Rising earlier and earlier with each passing evening, Jupiter will be unmistakable in the eastern sky. For those of you with either a great set of eyes or a pair of binoculars, you may be able to make out Jupiter's four largest moons dancing around the planet. Each day, notice their positions with respect to Jupiter. See if your views match those of the charts in the monthly astronomy magazines.

Finally, peeking out over the western horizon is the Queen of the planets, Venus. Don't worry about wondering which object is the planet: nothing beats Venus in brightness. Every night, it will climb slightly higher in the sky, becoming easier to find after sunset.

By the way, for those of you who wondered about my beginning statement, because there was no year zero, 1990 was not the beginning of the 90's decade, it closed out the 80's. So, in addition to wishing you all a great new year, let me be one of the few to wish you a happy and healthy new decade. ■

Letters to the Editor

I just received my copy of the November issue of *Connecticut Environment*. There is an error in my article on the common burdock that I want to call to your attention.

The third paragraph should read as follows: The leaves of the first year's growth resemble those of *rhubarb*, which is *poisonous*. The article reads as if the burdock leaves are poisonous: "The leaves of the first year's growth (referring to the burdock) which are poisonous resemble those of rhubarb."

Someone may pick up this and write you about it because I seem to be saying in one paragraph that the leaves of burdock are poisonous and in another paragraph that they are edible.

Winston Carter
Bristol

Please clarify two points in the recent article on Wildlife Enforcement.

First, the men who are the subject of the article are poachers, not hunters, and poachers are criminals. Poachers break laws by illegally taking game animals in one of several ways: out of proper hunting season; exceeding legal game limits; or by using improper methods such as blinding deer at night and shooting them.

Secondly, the poachers in this story misused archery equipment and terribly abused those bear cubs. It makes my heart sick to learn of the disrespect and violence with which these poachers abused animals. Conversely, a true hunter has an innate sense of reverence and respect for game, and when a hunter earns the opportunity for a shot, he strives for a quick, clean kill. As an avid bowhunter and volunteer CE/FS Advanced Bowhunting instructor, I will attest to the fact that a well-placed hunting arrow is every bit as humanely lethal as a well-placed rifle bullet.

Thank you for the opportunity to comment on the abnormal actions of participants in a criminal activity which may have been misunderstood by your readers.

Sincerely,
Susan Carsten

Since 1982 I've made it mandatory that our town subscribe to *C.E.* for each member of our commission. We've found it very beneficial to have a "layman's" overview of all laws relating to wetlands, open space, and wildlife, to enable this commission to understand all the goals and ongoing objectives of state and federal planning, and to apply them to our local regulations as we constantly move towards a more sound environmental policy.

Your efforts are the foundations of change, and the State of Connecticut's dedication to its environment should be heard throughout this nation as the example to be set, with your magazine making it understandable to us all.

Keep it up.

Sincerely,

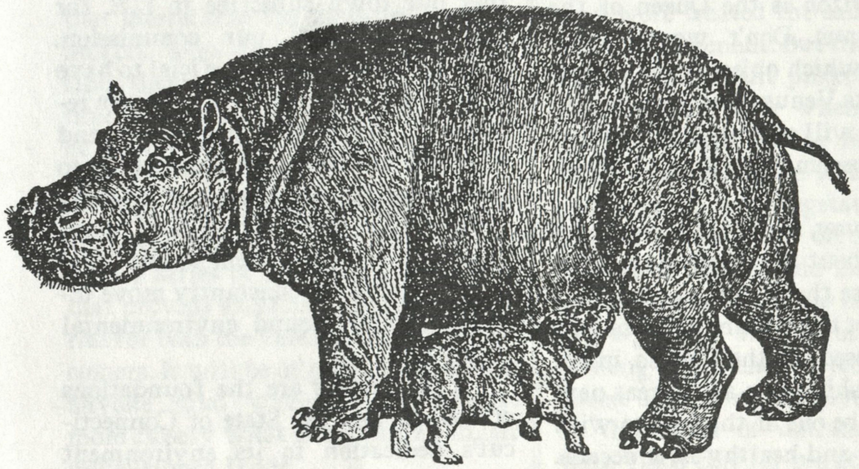
Henry Z. Moses, Chairman
Inland Wetlands Commission
Brooklyn, CT

Endnote

"To grapple effectually with even purely material problems requires more serenity of mind and more lofty courage than people generally imagine."

Joseph Conrad

Hurry Up! My Connecticut Environment just came in!



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